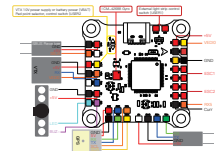
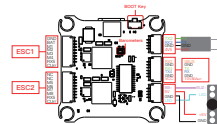
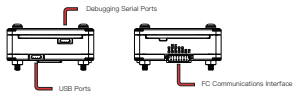


Connection

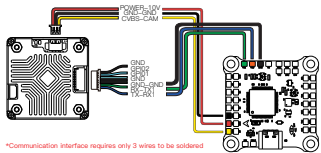
1.1 Flight Controller Solder Pad Interface Definitions



1.2.1 Guidance Module Port Definitions



1.2.2 Guidance Module Soldering and FC Wiring Instructions



*Communication interface requires only 3 wires to be soldered

1.3 Camera Installation

*When installing the camera, the camera angle should be between 10° and 20°.

Specifications

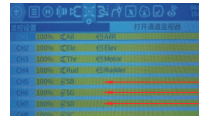
Model	Ratel Ultra AI
Image sensor	1/1.8 Inch Sensor
LENS	6mm
FOV	36.86° (H)*29.14° (V)
Video Output	PAL
Control Output	Mavlink
Frame Rate	50Hz
Track Target	People, Vehicles, etc.
Tracking Lock Distance	6mm lens Person: Max 150m; Vehicle: Max 300m
Minimum Tracking	16*16~128*128 pixels
Accuracy	3m
Lock/On	Support
Supply Voltage	9V-24V

Model	Neuron F405
Processor	STM32F405
Tourbillon	ICM42688
BEC	5V/3A ; 10V/2.5A
Memory	16MB
Firmware	CADX-CADDF4
Uart Serial Ports	5
LED Display Light	4
Input Voltage	2S-6S
Mounting Hole	30.5*30.5mm φ4mm

Model	Neuron 55/70
Protocols	BLHeliSuite16
Continuous Current	55A/70A
Maximum Current	60A/80A ((Maximum 10s)
Input Voltage	2S-6S
Current Ratio	160
Tuning Software	BLHeliSuite16.7.14.9.0.3
Driver Signal Support	PWM, Oneshot125, Oneshot42, Multishot, Dshot150, Dshot300, Dshot600
Fixed Hole	20/30.5mm-20/30.5mm φ4mm

Controller Settings

*In addition to the default 4 joystick channels (Yaw, Throttle, Pitch, Roll), there are 3 additional mapping channels to be set up, namely: Unlock/Off Lock (CH5); Self-stabilizing Mode/Fixed Height Mode (CH6); and Locked Tracking (CH7), the additional mapping channels require a 3-pass toggle, and the user can also define the other channels by himself/herself. As shown below:



Unlocking/Unlocking
Self-stabilizing Mode/Fixed Height Mode
Locking tracking

Mode Function Introduction

*Unlock/Lock: Controlling the Aircraft's Propellers
*Stabilize Mode:

1. The user controls the aircraft's tilt angle using pitch and roll. When released, the aircraft will automatically level itself. In windy conditions, continuous adjustments to pitch and roll are needed to keep the aircraft stationary.
2. Yaw controls the rate of the aircraft's rotation. Adjusting the yaw changes the aircraft's direction, and when the yaw stick is centered, the aircraft will maintain its current direction.
3. Throttle controls the average speed of the motors. The throttle input is proportional to the aircraft's speed and altitude.

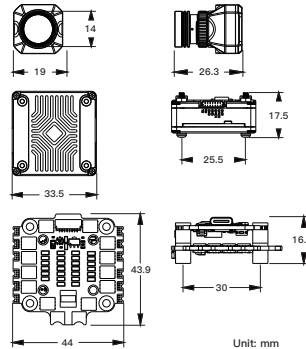
*Altitude Hold Mode:

1. When the throttle stick is centered, the aircraft will maintain its current altitude, but its position may drift due to wind direction and speed. The user can adjust the tilt angle using pitch and roll, and change the direction using yaw. (If the aircraft continuously adjusts its direction due to wind, increasing the yaw and roll input in the opposite direction will help.)
2. The throttle stick controls the aircraft's ascent and descent, with maximum rates of 5m/s. The ascent and descent rates are determined by the parameters MPC_Z_VEL_MAX_UP and MPC_Z_VEL_MAX_DN.
3. When switching from Stabilize Mode to Altitude Hold Mode, ensure that the throttle, yaw, pitch, and roll sticks are centered. If there is input on any axis other than throttle at the moment of switching, the aircraft may flip. Wait for the OSD information to show ANGL switching to ATK before continuing to operate.
4. During descent, you need to switch from Altitude Hold Mode to Stabilize Mode to lock the aircraft. When switching from Altitude Hold Mode to Stabilize Mode, the throttle input should be in the low position. If the throttle is in the mid to high position, the aircraft may shoot up when switching to Stabilize Mode.
5. The flight controller uses a barometric altimeter as the reference for altitude. The aircraft's flight altitude may be inaccurate due to changes in air pressure, and the altitude displayed on the OSD should be used for reference only.

*Lock-On Tracking:

1. To use the lock-on tracking feature, first enter Altitude Hold Mode and wait for ANGL to switch to ATK.
2. When the tracking stick is at maximum input, the system will automatically identify the target in the center of the crosshair. The aircraft will then automatically fly to the target's position. If the target moves, the tracking frame will also follow. During tracking, the user cannot control the aircraft with the sticks but can observe the target's movements through the video feed. If the tracked target and the locked target are in the same direction but at different positions, set the tracking stick to the middle position. At this point, pitch and roll can control the crosshair position. When the crosshair is on the desired target, set the tracking stick to maximum input to switch the target. If the tracked target and the desired target are not in the same direction, exit the lock-on state by setting the tracking stick to minimum input, manually adjust the direction, and then set the tracking stick to maximum input to re-lock the target.
3. When the tracking stick is at the middle position, you can change the locked target by moving the crosshair. The range of crosshair movement should not exceed 1/2 of the video feed's width, i.e., within 1/4 of the screen's left or right side. If the orientation angle between the locked target and the desired target is too large, it is recommended to exit tracking, manually adjust the direction, and then re-lock the target with fine adjustments to the crosshair.
4. In lock-on tracking mode, the ratio of the target's distance to the aircraft's altitude is approximately 10:3. For example, to track a target at a distance of about 100 meters, the aircraft should be at an altitude of 30 meters.

Dimension



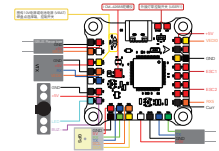
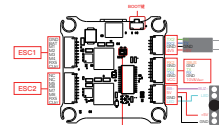
Unit: mm

Ratel Ultra AI Kit 使用说明



安装连线

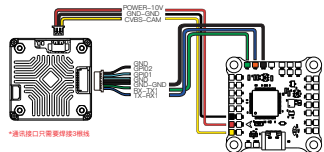
1.1 飞控焊盘接口定义



1.2.1 制导模块端口定义



1.2.2 制导模块焊接飞控线路指导



*通讯接口只需要焊接3根线

1.3 摄像头安装

*安装摄像头时，相机角度应在10°至20°以内

产品规格

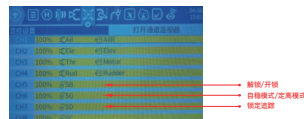
型号	Ratel Ultra AI
图像传感器	1/1.8 Inch Sensor
焦距	6mm
FOV	36.86° (H)*29.14° (V)
视频输出格式	PAL
控制输出格式	Mavlink
跟踪帧率	50Hz
最佳跟踪目标	人、车等
跟踪锁定距离	6mm镜头 人: Max 150m; 车: Max 300m
跟踪最小目标	16*16~128*128像素
末端打击精度(半径)	3m
是否支持锁定后	支持
宽电压输入	9V-24V

型号	Neuron F405
处理器	STM32F405
陀螺仪	ICM42688
BEC	5V/3A ; 10V/2.5A
存储器	16MB
固件	CADDFPV-CADDFX4
Uart串口	5
LED灯	4
输入电压	2S-6S
安装孔距	30.5*30.5mm φ4mm

型号	Neuron 55/70
协议	BLHeliSuite16
持续电流	55A/70A
最大电流	60A/80A (最长可持续10s)
输入电压	2S-6S
电流比例	160
调参软件	BLHeliSuite16.7.14.9.0.3
驱动信号支持	PWM, Oneshot125, Oneshot42, Multishot, Dshot150, Dshot300, Dshot600
固定孔距	20/30.5mm-20/30.5mm φ4mm

遥控器设置

*配置除了默认4个摇杆通道外(偏航, 油门, 俯仰, 横滚), 还需额外设置3个映射通道, 分别为: 解锁/开锁 (CH5); 自稳模式/定高模式(CH6); 锁定追踪(CH7), 额外映射通道需3通摇杆, 使用者也可以自己定义其他通道, 如下图:



模式功能介绍

*解锁/开锁: 控制飞行器起来和锁桨
*自稳模式 Stabilize Mode:

- 1.使用者通过俯仰 (pitch) 与横滚 (roll) 操纵飞行器的倾斜角度, 松开时, 飞行器将自动水平, 在有风的环境下, 通过不断修正pitch和roll以让飞行器定点停留。
- 2.偏航 (yaw) 控制飞行器转向速率, 通过修正偏航可改变飞行器的朝向, yaw轴回中心时, 飞行器将会保持当前方向不变。
- 3.油门 (throttle) 控制马达的平均转速, 油门输入值与飞行器的速度, 高度成正比。

*定高模式 Altitude Hold:

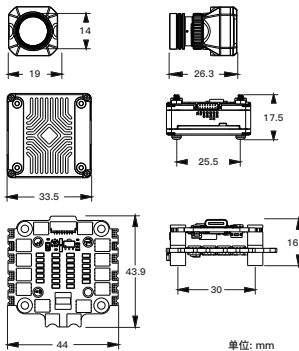
- 1.使用者油门回中时, 飞行器会在当前高度保持不变, 会受外在风向和风速影响, 飞行器位置会飘忽不定, 可通过pitch和roll, 改变飞行的倾斜角度, 通过yaw, 改变飞行朝向。(当飞行器不断调整朝向时, 会受风力影响, 朝杆量反方向时, 继续加大yaw和roll的输入值即可)
- 2.油门杆控制飞行器的上升和下降, 上升和下降最大值为5m/s, 上升速率和下降速率分别由参数MPC_Z_VEL_MAX_UP和MPC_Z_VEL_MAX_DN设定。
- 3.自稳模式切换成定高模式时, 请将throttle, yaw, pitch, roll等杆回中, 如果切换模式瞬间, 含有除油门以外其他轴的杆量输出时, 飞行器会出现侧翻现象, 等待OSD信息中的ANGL切换成ATK时, 即可继续操作。
- 4.飞行器下降时, 需从定高模式切换成自稳模式才可解锁, 定高模式切换成自稳模式时, 油门输入应处于低杆位, 处于中高杆位时飞行器会在切换至自稳模式时, 发生冲天现象。
- 5.飞控使用气压高度计测试结果为高度基准, 飞行器飞行的高度会受飞行气压的变化影响而不准确, OSD显示的高度仅供参考。

*锁定追踪:

- 1.锁定追踪功能, 需先进入定高模式, ANGL切换至ATK。
- 2.锁定追踪摇杆输入最大时, 会自动识别锁定十字光标中心区域目标, 此时, 飞行器将自动飞行至锁定框位置, 如果锁定框锁定的目标在移动时, 锁定框也会跟着移动, 飞行器追踪时, 使用者无法通过摇杆操纵飞行器, 但可以根据图传画面观察目标物动态, 当发现追踪的目标和锁定框锁定的目标在相同朝向, 不同位置时, 可以通过将追踪摇杆输入中间值, 此时pitch和roll可以控制十字光标位置, 当光标停留在使用者想要锁定的目标物时, 将追踪摇杆输入最大值, 即可切换目标, 发现追踪框锁定的目标物和目标物不在一个朝向时, 需要退出锁定状态, 即追踪摇杆输入最小值, 使用者手动调整朝向, 再次输入最大值, 重新锁定目标。
- 3.追踪摇杆输入中间值时, 可通过移动十字光标更换锁定框锁定的目标, 光标移动的范围不建议

超过图传画面比例的1/2, 即画面中心向左或者向右各1/4, 如发现追踪框锁定的目标和想要追踪的目标朝向角度偏大时, 建议退出追踪, 手动调整好方位, 再次锁定, 通过光标微调。
4.锁定追踪模式下, 目标物的距离和飞行器飞行高度的比例约为10:3, 即100米左右的距离, 飞行器要在30米的高度才可使用锁定追踪。

外形尺寸



单位: mm